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Students' perceptions of a blended web-based learning environment

Abstract

The enhanced accessibility, affordability and capability of the Internet has created enormous possibilities in terms of designing, developing and implementing innovative teaching methods in the classroom. As existing pedagogies are revamped and new ones are added, there is a need to assess the effectiveness of these approaches from the students' perspective. For more than three decades, proven qualitative and quantitative research methods associated with learning environments research have yielded productive results for educators. This paper presents the findings of a study in which *Getsmart;* a teacher designed website was blended into science and physics lessons at an Australian High School. Students' perceptions of such an environment are discussed. It also highlights the differences in the perceptions of students in the senior and the middle years of schooling. The paper also explores the impact of teachers in such an environment. The investigation undertaken in this study also gave an indication of how effective *Getsmart* was as a teaching model in such environments.

1 Introduction

The inability of the school system to effectively engage learners has probably led to problems in school subjects such as science. According to Lowe (cited in *Science Initial In-service Materials*, 1999), science education was still based on the "Moses model", where the knowledge is conveyed by the teacher "usually male" and students are expected to memorise and regurgitate the content. Consequently, many students view science as boring and irrelevant and have a "where will I use this" attitude. Goodrum, Hackling and Rennie's (2001) report titled *The Status and Quality of Teaching and Learning of Science in Australian Schools* pointed out that on average, the actual picture of science was "disappointing" and the quality of teaching ranged from "brilliant to appalling" (p. 85). As a result of this grim picture, enrolments in science have probably diminished significantly and according to Harrison (as cited in Roberts, 2002, p. 13) science is "in danger of becoming an optional snack in a smorgasbord of subjects".

The report *Australia's Teachers: Australia's Future* (2003) argued for an immediate need to improve "scientific and mathematical education and technological capability" (p. 1). It also emphasised the need for ongoing innovation as a prerequisite for "future growth and prosperity in a competitive global economy" (p. 1). Apart from giving science, technology and mathematics a high national priority in education, the report also suggested the need for high levels of research and development. The report also highlighted the decline in the number of students who completed high school subjects such as physics, chemistry and biology as a national concern.

Science and technology has been a priority in various policies outlined by the Federal and State Governments and Education departments in Australia. In Queensland for instance, the *Government's Smart Queensland: Smart State Strategy 2005-2015* and the

Department of Education and the Arts' *Strategic Plan 2005 – 2009* (*Strategic Plan 2005 – 2009*, 2005) places significant emphasis on ICT's and science.

Is blending technologies in science a feasible option in a high school environment? Cooke (2005) pointed out that all innovative approaches, no matter how simple or complex should be designed with the students in mind. Students' perspective on such innovations was a critical issue. For many high school students, systematic integration of web-based applications into teaching routines is still in its infancy. New initiatives can be sustained provided there are appropriate research and development mechanisms in place to evaluate them. By applying some of the research techniques associated with learning environments, the success of such innovative practices can be adequately ascertained.

In this study, *Getsmart,* a teacher-designed interactive website was blended into junior science and senior physics courses at a high school in Australia. Allen and Seaman (2003) defined courses based on their online contents as follows: 1% to 29% online content was termed a web-facilitated course, 30% to 79% was a blended or hybrid course and an online course had greater than 80% online content. Students engaged in this approach over a school term of 10 weeks. Their perceptions of such a learning environment was investigated in this study.

2. Design and Development of *Getsmart*

Liber (2005) argued that the design of e-learning environments should not be left to the technicians and programmers. There is a need for teachers to become more proactive in driving the technology. Through such an approach, teachers have a far greater control in terms of how the learning activities are designed, developed and sequenced.

In this study, *Getsmart* was designed on the electronic cognitive apprenticeship teaching model (Collins**,** Brown, & Newman, 1989; Wang & Bonk, 2001) by a teacher with no formal training in the field ICT's. Within this framework a variety of learning opportunities such as modelling, coaching, scaffolding, articulation, reflection, exploration, and questioning were created through web-based lessons, tests, online chats, and interactive activities (Chandra, 2004).

Brooks, Nolan and Gallagher (2001) proposed numerous features that websites should have in order to improve learning outcomes. A high degree of interaction was one of their suggestions. Features which promote interaction include provisions for asynchronous discussion (emails and bulletin boards) and synchronous discussion (chat rooms). They suggested that websites should use hypertext links to enable readers to make decisions about their reading, web-based assessment tools such as quizzes and tests, visual media such as still images and images in motion, and a "neat" domain address to identify the website.

Janicki and Liegle (2001) developed WebTAS (*Web-Based Tutoring Authoring System*) which blended parts of instructional design theories and ideas proposed by web

researchers. WebTAS incorporated features such as multiple examples and exercises, consistent layout design, feedback management, and tracking process capability.

The educational value of the website has to blend in with good web design principles. Issues such as the process, interface and site designs, page design, typography, editorial style, graphics, and multimedia were recognized as essential ingredients of a good website (www.webstyleguide.com). While all these ideas were acknowledged in the design of *Getsmart,* one of the key aspects which steered its development was the feedback received from the students.

The website had an appropriate domain address (u2cangetsmart.com). Students accessed the website via the *Splash Page*. Once their user name and password was validated, students were then able to access the *Contents Page.* A part of this page is shown in Figure 1.

Figure 1. Part of the content's page of Getsmart.

The *Lesson Pages* were designed for single topics that focussed on a handful of concepts. Each page highlighted the key terms and formulae. Links were also provided to WebPages that were either embedded in *Getsmart* or on other websites. Discussion questions and solutions to worked examples were also provided on most pages. Students also had the option to email queries. Downloading lesson worksheets were mandatory. A part of the lesson page on Light Dependent Resistors, designed for year 12 physics students, is shown in Figure 2.

Figure 2. Part of the lesson page on Light Dependent Resistors

In Australian schools, the quality of formative assessment and teacher feedback on student progress varies. Goodrum, Hackling, and Rennie's (2001) report on the teaching and learning of science in Australian schools established that only 7% of high school students were given a quiz to see how they are going in every lesson and 16% participated in formative tasks once a week. Their report also showed that 23% of the student population had never seen such tests and almost one third had never received any feedback from their teachers on how they were going in science.

Therefore, an online test was linked to each lesson which gave students instant feedback. The results were written to a database against the user's name. Each test consisted of either ten multiple-choice or short answer questions. The feedback indicated the percentage correct but did not indicate which of the questions were correct or incorrect. This was done on purpose to ensure that students revisited the questions and compared their answers with their colleagues and teachers. This created discussion opportunities. A part of the test page linked to the Radioactivity lesson (designed for year 12 physics students) is shown in Figure 3.

Figure 3. Part of the test page on Radioactivity

3. Implementation of *Getsmart*

The website was aimed at students in years 10, 11, and 12 (ages 15-17 yrs.). Year 10 students studied junior science while students in years 11 and 12 studied physics. For this reason, the ease of use was central to its development. Online lessons were designed to actively engage students for the entire period. Students accessed the website for one period each week and web-based lessons were designed for units of work that lasted for a term. Each school period lasted for a maximum of 31 minutes (it generally required three to five minutes for students to log in to the school computers). Students could also access the website outside class times including from their homes.

The research sample comprised of 302 students in 11 classes. The breakdown of the sample was as follows: year 10 science (9 classes, 261 students), year 11 physics (1 class, 25 students), year 12 physics (1 class, 16 students). While the survey was administered to all students (excluding those who were absent on the day the survey was administered), not all returned.

4. Learning Environments

Research has shown that the learning environment is an alterable educational variable which can directly influence cognitive and affective outcomes (Wang, Haertel, & Walberg, 1993; Waxman & Huang, 1998). Jensen (1998) pointed out that 30 to 60 percent of our learning was due to our brain's wiring and 40 to 70 percent was a result of the environmental impact. From this suggestion, it is obvious that while the environment is not the only variable which affects learning outcomes; nonetheless, it is a very important one. By using various reliable learning environment questionnaires and a variety of qualitative methods, researchers have been able to assess the perceptions of both teachers and learners of their learning environments. According to Tobin (1998), the use of both qualitative and quantitative methods enables researchers to view the learning environments from different perspectives.

The *Web-based Learning Environment Instrument* (WEBLEI) (Chang & Fisher, 1998, 2003) was used to gather quantitative data on students' perceptions of their web-based learning environment in a tertiary-level environment. In the design of the WEBLEI, Chang and Fisher (1998) created four scales, the first three of which were adapted from Tobin's (1998) work on *Connecting Communities of Learning* (CCL). The CCL was developed by Tobin to study the perceptions of maths and science education students enrolled in an asynchronous mode at a college.

The WEBLEI measures students' perceptions across four scales – Access, Interaction, Response, and Results. According to Chang and Fisher (1998), for students to use this medium, they have to successfully access the online material. Consequently, the Access scale establishes the extent to which variables associated with accessing this medium meet students' expectations. Once the students have logged in successfully, they should be able to interact productively with their peers and their teachers. Hence, the Interaction scale explores the extent to which this is achieved from the students' point of view. The Response scale gives an indication of how they felt about using a web-based medium and the Results scale gives an idea of the extent of their accomplishment of the learning objectives by using the learning resources accessed through this medium.

The initial version of the WEBLEI was designed by Chang and Fisher (1998, 2003) to quantify students' perceptions of their learning environment in a tertiary institution where the entire course was offered online. In this research, the course was offered in a blended environment to students in a high school. While in a university environment, courses are generally delivered through sophisticated software, in this instance, the course was delivered by *Getsmart.* In this teacher-developed website, the learning activities were different. Therefore, the 32 items in the WEBLEI were amended to suit this study.

The purpose of the research described in this paper was to assess the effectiveness of an innovative website as a teaching model in a blended learning environment by using the WEBLEI and additional qualitative methods.

5. Data Collection and Analysis

Once students had completed their unit of work in the blended mode, the WEBLEI and a survey requiring written responses to open-ended questions were administered. According to Mitchell and Jolley (2004) open- ended had two distinct advantages: (1) it avoids "putting words in participants' mouths (p. 195); and (2) it creates opportunities for the investigation of the beliefs and opinions of the participants. Emails from students created further opportunities to gather their views on a blended web-based learning environment. Students answered a number of open-ended questions at the same time as the WEBLEI survey was administered.

All emails and answers to written questions were read and the key points were identified in each instance. For analysis purposes, this information was then recorded onto a *Microsoft Access* database. The qualitative data was then analysed by grouping the responses into categories which reflected the student responses.

Data from the WEBLEI survey were coded and entered as 1 (*Strongly Disagree*), 2 (*Disagree*), 3 (*Neither Agree nor Disagree*), 4 (*Agree*), and 5 (*Strongly Agree*). Responses that were illegible or ignored were eliminated pair wise from the survey. Statistical measurements such as mean, median, standard deviation, Cronbach alpha reliability, and discriminant validity were determined using the *Statistical Package for the Social Sciences* (SPSS) and *Microsoft Excel*.

6. Results

6.1 Reliability and validity of the modified version of the WEBLEI

The Cronbach alpha reliability coefficient measures the internal consistency of a scale and is based on the average inter-item correlation. All values above 0.60 obtained through this calculation are considered to be acceptable (Nunnally, 1967). In this study, the alpha reliability coefficient for the four scales survey ranged from 0.78 to 0.86 (Chandra, 2004). The discriminant validity determines the extent to which a scale measures a unique dimension not covered by other scales in the instrument. In this study, the mean correlation of a scale with the other three scales was taken as a measure of discriminant validity and ranged from 0.52 to 0.59 for the four scales (Chandra, 2004). In keeping with past leaning environment validation studies, an ANOVA analysis was used to determine whether the WEBLEI could distinguish between classes. The eta^2 statistic is the proportion of variance in the dependent variable that is explained by the independent variable. In this case, class membership was the independent variable and the eta^2 was significant for the Interaction ($p<0.01$), Response ($p<0.05$), and Results ($p<0.01$) scales.

For the purpose of this study, the WEBLEI was considered a valid and reliable instrument.

6.2 Results of use of the WEBLEI

The sample in this study was comprised of junior science and physics students. The mean obtained for each of the WEBLEI scales was very close to 4 for all scales (except for the Interaction scale where it was 3.53). For the Response and Results scales, the means were slightly higher than those reported by Chang and Fisher (2003). They reported means of 3.96 for the Access scale, 3.55 for the Interaction scale, 3.37 for the Response scale and 3.72 for Results scale. In this research, means of 3.94, 3.51, 3.74, and 3.88 were obtained for the Access, Interaction, Response, and Results scales respectively (Table 1).

Table 1

Mean and Standard Deviations for the Four scales of the WEBLEI

A mean of 3.94 (*SD* = 0.66) (Table 1) for the Access scale suggested that students agreed that their learning environment was convenient and easily accessible at locations suitable to them. It enabled them to work at their own pace. A web-based environment also gave them greater autonomy in achieving their learning objectives.

The Interaction scale produced a mean of 3.58 (*SD* = 0.71) (see Table 1), the lowest of all three scales. An average of three implied that students neither agreed nor disagreed with all the items in the scale. A mean of four suggested that they agreed with the statements. A mean of 3.58 suggests that there was agreement to a certain degree to the items of the Interaction scale. However, the Items 9, 11, 12, and 13 that were related to emails were the ones in which the students expressed the greatest uncertainty (*Neither Agreed nor Disagreed*). The results of these items could be interpreted as follows. Students had the option of asking teachers questions by sending an email (Item 11), however, they were not sure if they felt comfortable sending teachers emails (Item 12). For this reason, not all students sent emails (Item 9) and consequently, they did not receive a reply from their teachers (Item 13). However, of the 171 emails, received in the study, very few had specific questions that needed to be addressed. Most of them highlighted positive aspects of the blended approach to learning science and physics. More to the point, while all emails were acknowledged and responded to, it was the researcher who replied them and not the teachers (the researcher taught 4 out of the 11 classes in this study). This provides another explanation for the low mean obtained for Item 13 ("The teacher responds to my emails").

Emails as a vehicle for electronic interaction were not preferred to the extent to which they were initially intended, in a blended environment. Students' qualitative responses provided additional evidence on this issue.

I agree that I can communicate via email but prefer to have my questions answered face to face.

I didn't communicate via email because there might be a pause of one day before a response, in which case I would have already forgotten my problem.

I don't like the email all that much and if I don't understand something, I'd rather talk to someone face to face.

The WEBLEI was initially designed for students at universities in off- campus environments where the interaction between learners and educators via the Internet was essential. In a blended learning, high school environment, learners are probably looking for an interactive learning environment with technology. They are looking for an opportunity to be away from the classroom momentarily and from human beings.

Lessons on Getsmart... are easier to understand and comprehend because you can read it at your own pace and you don't have to listen to a teacher mumble on.

The results of the Response scale were comparatively higher. A mean score of 3.74 (*SD* = 0.72) (see Table 1) was obtained which implied that students generally agreed that web-based learning was satisfying and it enabled them to interact with other students and their teachers. They also enjoyed learning in this environment and they believed that this approach held their interest in the subject for the whole term.

For the Results scale, Chang and Fisher (1998) reported a mean of 3.75. In this research, the mean score of 3.88 (*SD* = 0.68) (see Table 1) for this scale suggested that students agreed they could establish the purpose of web-based lessons. It was also easy to follow, well sequenced, and clear. The structure kept them focussed and it helped them learn better the work that was done in class. The content was presented well and it was appropriate for delivery in a web-based learning environment. The tests at the end of the lessons, improved their understanding in the subject.

6.3 Perceptions of the learning environment – the subject factor

A further analysis was carried out to ascertain if there were any variations in the perceptions of physics and junior science students of their web-based learning environments. The results are reported in Table 2.

Table 2
Mean and Standard Deviations for the Four Scales of the WEBLEI in Junior Science and Senior Physics classes

Physics and junior science students had means of 3.95 (*SD* = 0.67) and 4.18 (*SD* = 0.40) respectively for the Access scale. While the difference between the means was statistically significant ($p<0.05$) these means suggested that students in both groups agreed that the web-based learning environment was convenient, gave them autonomy and enabled them to work at their own pace. This was supported by qualitative data in which students explained their liking for such an approach by giving reasons such as:

> It is easier to understand and comprehend because you can read it at your own pace and you don't have to listen to a teacher mumble on.
>
> Year 10 science student

> You can over the work again as many times as you like. Having the Internet sheets from class lessons help you revise and study. I can go over and over the parts I don't really understand until I do. It is easy to read and understand.
>
> Year 10 science student

> I think that if you miss a class at school, for example, you were sick then you can go on the net and obtain the information that you missed. It is a very helpful tool.
>
> Year 12 physics student

The two means for the Interaction scale were 3.51 (*SD* = 0.73) and 3.96 (*SD* = 0.47) for the junior science and physics groups, respectively. The difference between these means was statistically significant ($p<0.05$). The physics group interacted more through emails, online experiments, and chats than did the science students which appears to explain their higher mean for this scale. The quality of the interaction between the website and the user was an important aspect measured this scale. Student's written responses gave further evidence on this mode of interaction:

> It is easy to follow on the net and the test at the end keeps me-thinking.
>
> Year 10 science student

> Go on links...look at pictures…tests help you know what you need to work on.
>
> Year 10 science student

> I must admit, however, that the chat sessions were quite helpful. It forced me to keep up with the work being covered in class and presented some more stimulating questions.
>
> Year 12 physics student

> Online experiments were time consuming but a good exercise.
>
> Year 12 physics student

For the Response scale, means of 3.79 (*SD = 0.71*) and 3.89 (*SD = 0.45*) were obtained for the junior science and physics groups, respectively. These means suggested that many students believed that the design and layout of the website increased their understanding of the concepts covered in their lessons. The lessons also held their interest and they felt satisfied learning through this medium. Data gathered qualitatively supported this finding:

> You can save a lot of time doing multiple choice questions instead of looking up the textbook. There are links to other websites on which you can learn as well. The presentation of the website helps maintain interest (looks better and brighter and not like the textbooks).
>
> Year 11 physics student

> It is presented in a manner that is easy to follow, you can re-read what you do not understand, is put in a way where the content is…in appropriate categories…you can find your weaknesses.
>
> Year 10 science student

> The web pages serve well in collating the information learnt. The multiple choice questions are good for exam preparation.
>
> Year 12 physics student

> There are diagrams and well planned notes help you understand and interpret the work.
>
> Year 12 physics student

> I found that the layout of the lessons was very easy to follow and the pages included all the information needed to understand the topic.
>
> Year 12 physics student

The Results scale of the WEBLEI gave an idea of what students accomplished from this web-based learning approach. For this scale, both junior science and physics students achieved means of 3.90 (*SD* = 0.63) and 4.17 (*SD* = 0.32), respectively. These results confirm that students were satisfied that the website addressed their learning needs. Qualitative data further supported this finding.

> It only takes a few hours to learn about almost everything in optics and achieve good results in the test.
>
> Year 11 physics student

> Good overview of what needs to be learnt for the exam. I can ask questions…in the tutorials. Worked examples on web show how an answer is obtained.

Year 12 physics student

> More comfortable and relaxed environment, opinions and intellect of classmates assists to learn.
>
> Year 12 physics student

> If I don't understand something the first time when explained in class, I can read about it on the internet to help me understand. The chat also helps.
>
> Year 12 physics student

> Students can have another source where they can gain information. This enables them to have a better opportunity to achieve better results.
>
> Year 10 science student

> The information that was provided as well as the revision sheets / worksheets … aided my learning.
>
> Year 12 physics student

The difference in the means across the four scales is largely because physics students are probably more motivated than students are in junior science classes. Consequently, they perceive their learning environments more positively than did those in junior science. Waxman and Huang (1998) for instance also reported that students in the middle school perceived their learning environments less favourably than those in elementary or high schools. Some researchers have also suggested that during the middle school years, "young people lose their enthusiasm for learning, disengage from classroom activities and make the least progress in learning" (*The middle phase of learning,* 2003, p. 12). This probably explains the variation in the two groups.

6.4 Perceptions of the learning environment – the teacher factor

In many instances, when innovations fail, teachers are often blamed. It has been recognised that teaching online courses is a complex and challenging task (Anderson, Rourke, Garrison, & Archer, 2001). Additionally, issues relating to technical aspects of delivering quality educational materials and training students to foster knowledge acquisition within this new environment can be a complicated process (Gold, 2001). In such environments, there was some evidence that the role of a teacher was far more important than the instructional design of the content (Eklund, Kay, & Lynch, 2003).

To what extent do teachers make a difference in such environments? While it is difficult to measure the impact of teachers on student perceptions in such an environment, the difference between students' perceptions in different classes can be successfully determined. In this study, the first author (researcher) was one of the teachers whose

classes used *Getsmart* in a blended learning environment. He had four classes (two junior science and two physics classes) out of the 11 classes that participated in this study. Table 3 lists the means for each scale obtained in his classes and the combined mean of the rest of the group.

Table 3

Mean and Standard Deviations for the Four Scales of the WEBLEI in the Researcher's Classes' and the Other Classes.

As shown in Table 3, the mean for all four scales was higher in the researchers classes than the mean for the rest of the group. The difference in the means of the Interaction and Results scales were statistically significant ($p<0.01$ and $p<0.05$ respectively). These results show that the role of teachers in such an environment may be important which supports the findings of other researchers (e.g., Eklund, Kay, & Lynch, 2003). Additionally, how teachers market and apply appropriate teaching pedagogies in such an environment may be crucial in influencing students' perceptions. While all classes (except one) had the same amount of time on the Internet (in school time), the manner in which the online activities were integrated into the traditional classes depended on the teacher. The degree of enthusiasm and commitment of the teacher to an alternative teaching approach could also be an aspect which influenced student perceptions. Another important issue is that learning styles and motivation of students could vary between classes. While all classes were meant to be theoretically equivalent in terms of academic ability, sometimes the mix of students can also be a mitigating factor in terms of how students' perceived their learning environments.

The impact of this factor on students' perceptions was further explored by examining the WEBLEI results in the four classes that were taught by the researcher (Table 4). Online lessons were integrated in the same manner in three of the four classes. The Year 12 Physics class could not obtain access to computers during class time. They had to access the website in their own time either at school or at home. Significantly, they had an online "chat" tutorial school for an hour, each week for a term.

Table 4

Mean and Standard Deviations for the Four Scales of the WEBLEI in the Researcher's Classes.

It was interesting to note that one of the classes (Year 10.2 science class) scored the lowest means on all four scales (Table 4). The mean ranged from 3.43 to 3.87 for the Year 10.2 science class, which suggested that they agreed to some of the items of each scale. However, the degree of agreement in this class was the least when compared with the other classes. The standard deviations of the Year 11 Physics class (SD = 0.41, SD = 0.34, SD = 0.40, SD = 0.34 for the Access, Interaction, Response and Results scales respectively) were significantly lower than other classes which indicated that there was least variation in terms of how students scored the items on the WEBLEI. On the whole,

the standard deviations for each scale for physics students was lower than the science students, showing that there was a greater uniformity in terms of how physics students perceived their learning environments than those in junior science classes. The variation between class means also showed that even though students may have the same teacher and they are all taught the same way, there is probably a limit to how much a teacher can influence students' perceptions of the learning environment. As Jensen (1998) pointed out, 30 to 60 percent of our learning was due to our brain's wiring, and 40 to 70 percent is a result of the environmental impact. Hence, other factors can also influence student perceptions.

7. Discussion and Conclusions

The learning environments research undertaken in this study has demonstrated the usefulness of *Getsmart* as a model for teaching science and physics in a blended environment. It has produced a number of findings which are significant to blended web-based learning environments in high school science classrooms. Some of these findings were as follows.

a) The data generated through the WEBLEI, written surveys and emails suggested that students had positive perceptions of their web-based learning environment. Results gathered across the four scales of the WEBLEI (see Table 1) for instance, suggested that the integration of web-based learning through *Getsmart* in science and physics lessons was convenient and accessible, promoted autonomy of learning and enabled students to work at their pace. It also promoted positive interactions between peers during Internet lessons, enhanced enjoyment and learning opportunities in the subject, and sustained interest in the subject. Lessons on *Getsmart* were clear, easy to follow and understand, and well sequenced. Online tests provided valuable feedback.

b) While emails are productive for the ideal student who reviews his or her work on a daily basis, identifies problems, and forwards queries electronically to his or her teacher, very few students probably fall in this category. High schools are probably still a few years away from producing a learning culture where learners have the confidence to conduct their learning in this manner. For many, asking the teacher questions face to face in class is probably viewed as a more feasible and preferred option.

c) According to the WEBLEI data, senior physics students were more positive about their web-based learning environment than their junior science counterparts (see Table 2). It could be assumed that physics students were more motivated because they enrolled in the subject by choice, whereas for the junior science students had no options – it was a compulsory subject. For this reason, it can be suggested that not all students in the junior science classes had a high level of motivation towards their subject which probably impacted on the results of the WEBLEI survey.

d) Students in the researchers' class scored higher means across all four scales of the WEBLEI (see Table 3). However, there were notable differences in the means of the WEBLEI scales between the classes taught by the researcher (see Table 4). While it is

widely recognised that teachers' enthusiasm about an innovation can be an important factor in terms of how students perceive the innovation from a learning perspective, in this instance, the small sample warrants further research in this area. Perhaps, research into teachers perceptions of a blended web-based should also be conducted concurrently.

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CONTENTS PAGE: CHOOSE YOUR TOPIC

CHECK MY RESULTS NEW

CHECK MY LOGIN HISTORY NEW

SUBJECTS & TOPICS

PHYSICS

MOTION Scalars & Vectors; Speed & Velocity, Acceleration, Equations of Motion; Motion graphs(1); Motion graphs(2), Application of motion concepts; Free falling objects, Projectile motion, Circular motion, Non-uniform circular motion, Review Questions(1), Review Question(2)

ENERGY & MOMENTUM Momentum; Conservation of momentum; Momentum Problems (1); Momentum Problems (2); Kinetic Energy; Potential Energy; Kinetic and Potential Energy combined ;Work and Energy; Forces(1), Forces(2), Review Questions

ELECTRONICS Semi conductors, More on doping, Common electronic components; Capacitors, Diodes, Light Dependent Resistors in action, Capacitors in action, NPN & PNP Transistors, Logic Gates, Electronics Revision

ATOMIC PHYSICS History of the atom, The hydrogen atom, Frank-Hertz Experiment, Radioactivity, Radioactivity data analysis, Binding Energy, Atomic Physics Revision

ELECTRICITY AND MAGNETISM Electric charges (Chapter Summary), , Review questions , Electricity formula review

OPTICS Plane mirrors, Reflection in a curved mirror, Ray diagrams (concave mirrors), Ray diagrams (convex mirrors), Mirror formula, Practice ray diagrams (mirrors), Mirrors chapter summary, Refraction, Convex Lens, Concave Lens, Practice ray diagrams (lens), Lens formula, Optics revision

Figure 1. Part of the content's page of Getsmart.

line figure

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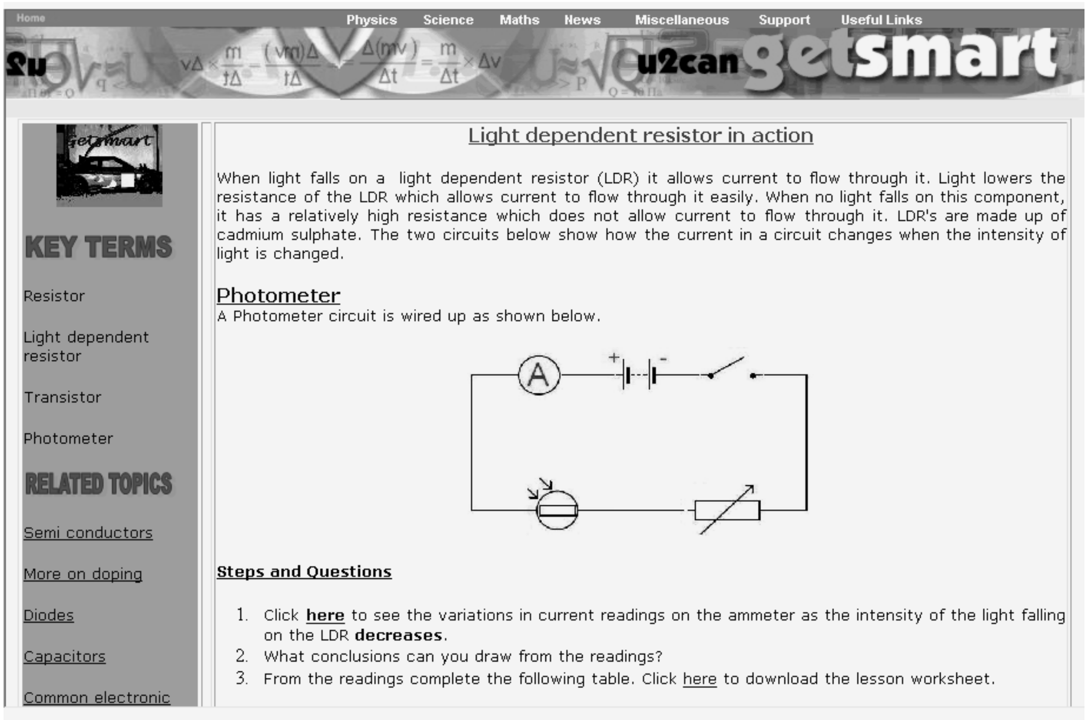

Figure 2. Part of the lesson page on Light Dependent Resistors

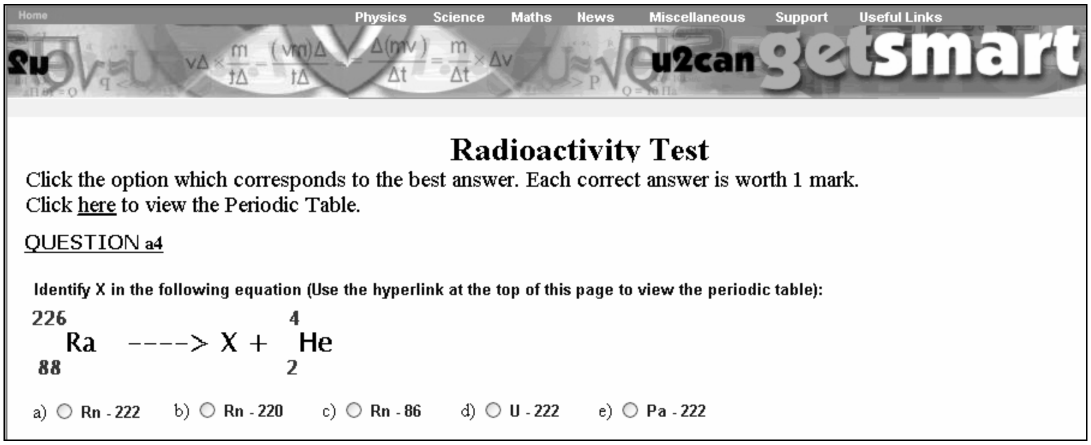

Figure 3. Part of the test page on Radioactivity

Table 1

Mean and Standard Deviations for the Four scales of the WEBLEI

WEBLEI Scales	Descriptive Statistics		
	Mean	Standard Deviation	Valid Cases
Access	3.94	0.66	214
Interaction	3.51	0.77	213
Response	3.74	0.72	213
Results	3.88	0.68	214

Table 2
Mean and Standard Deviations for the Four Scales of the WEBLEI in Junior Science and Senior Physics classes

WEBLEI Scales	Descriptive Statistics						
	Mean			Standard Deviation		Valid Cases	
	Junior science (1)	Senior physics (2)	Difference in means (1) – (2)	Junior science	Senior physics	Junior science	Senior physics
Access	3.95	4.18	-0.23*	0.63	0.43	177	31
Interaction	3.51	3.96	-0.45**	0.73	0.47	175	31
Response	3.79	3.89	-0.10	0.71	0.45	178	31
Results	3.90	4.17	-0.27*	0.63	0.32	175	31

*$p<0.05$
**$p<0.001$

Table 3

Mean and Standard Deviations for the Four Scales of the WEBLEI in the Researcher's Classes' and the Other Classes.

WEBLEI Scales	Descriptive Statistics						
	Mean			Standard Deviation		Valid Cases	
	Researcher's Classes[#] (1)	All other classes[##] (2)	Difference in means (1) – (2)	Researcher's Classes	All other classes	Researcher's Classes	All other classes
Access	3.99	3.98	0.01	0.61	0.61	78	130
Interaction	3.79	3.44	0.35**	0.62	0.74	79	127
Response	3.90	3.74	0.16	0.63	0.70	77	132
Results	4.05	3.88	0.17*	0.55	0.61	77	129

Researcher taught 4 classes
The remaining 7 classes were taught by 6 teachers
*p<0.05. **p<0.01.

Table 4

Mean and Standard Deviations for the Four Scales of the WEBLEI in the Researcher's Classes.

WEBLEI Scales	Descriptive Statistics							
	Mean				Standard Deviation			
	10.1 science	10.2 science	11.1 physics	12.1 physics	10.1 science	10.1 Science	11.1 physics	12.1 physics
Access	3.98	3.74	4.16	4.22	0.72	0.63	0.41	0.49
Interaction	3.92	3.43	4.05	3.76	0.71	0.55	0.34	0.63
Response	4.10	3.70	3.93	3.81	0.73	0.70	0.40	0.56
Results	4.08	3.87	4.26	3.99	0.71	0.58	0.34	0.18
Valid Cases	25	23	21	10	25	23	21	10